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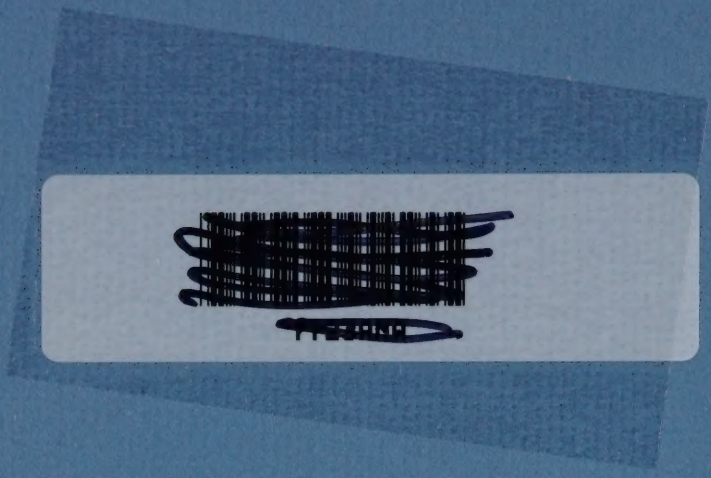

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TABLE OF CONTENTS

		Page
1.	INTRODUCTION	1-1
	1.1 General Background	1-1
	1.2 Study Objectives	1-1
2.	SUMMARY AND CONCLUSIONS	2-1
3.	DESCRIPTION OF THE ENVIRONMENT IN THE VICINITY OF THE NAUGHTON POWER PLANT	3-1
	3.1 Existing Climate	3-1
	3.2 Existing Air Quality	3-7
	3.3 Future Air Quality	3-12
4.	DATA ANALYSIS	4-1
	4.1 The ERT Air Quality Model	4-1
	4.2 Model Input Data and Assumptions	4-1
	4.3 Background Concentrations	4-6
5.	MODEL RESULTS	5-1
	5.1 Level One: Naughton Unit 4 Alone, 1985 Incremental Increase	5-1
	5.2 Level Two: Naughton Units 1 through 4: 1985 Cumulative Impacts	5-6
	5.3 Level Three: Naughton Units 1 through 5, 1990 Cumulative Impacts	5-14
REFERENCES		

1. INTRODUCTION

At the request of the Wyoming Bureau of Land Management (BLM), Environmental Research & Technology, Inc. (ERT) has performed a "worst-case" modeling analysis to ascertain the air quality impacts attributable to the expansion of Utah Power and Light Company's Naughton Power Plant.

1.1 General Background

The Utah Power and Light Company (UPL) plans to enlarge its electrical generating capacity by adding two units to the Naughton plant, located five miles southwest of Kemmerer, Wyoming (see Figure 1-1).

The planned facility would consist of two additional 430 megawatt (Mw) coal-fired, water-cooled generating units, numbers 4 and 5, to be adjacent to the existing Naughton plant, which consists of three units with capacities of 160, 220, and 330 Mw. The first of the proposed new 430 Mw units is assumed to be operational in 1985 and the second in 1990. When operated at rated capacity, the two 430 Mw units would require about 462 tons of coal per hour or about 4 million tons per year. It is proposed that the coal be obtained locally from the proposed North Block coal mine shown in Figure 1-1.

1.2 Study Objectives

This study was done to determine the worst-case impacts of the new electrical generating units on ambient levels of total suspended particulate matter (TSP), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2) for analysis years 1985 and 1990. The results of the study are presented in three levels.

Level One describes the incremental pollutant increase attributable to the addition of unit 4 alone in 1985. The resulting predicted concentrations are compared to the Prevention of Significant Deterioration (PSD) increments in accordance with the Clean Air Act Amendments of 1977. PSD regulations apply to areas where ambient air quality levels comply with state standards. The study area around the Naughton plant has been designated Class II, defined as an area where deterioration that would normally accompany moderate, well-controlled growth

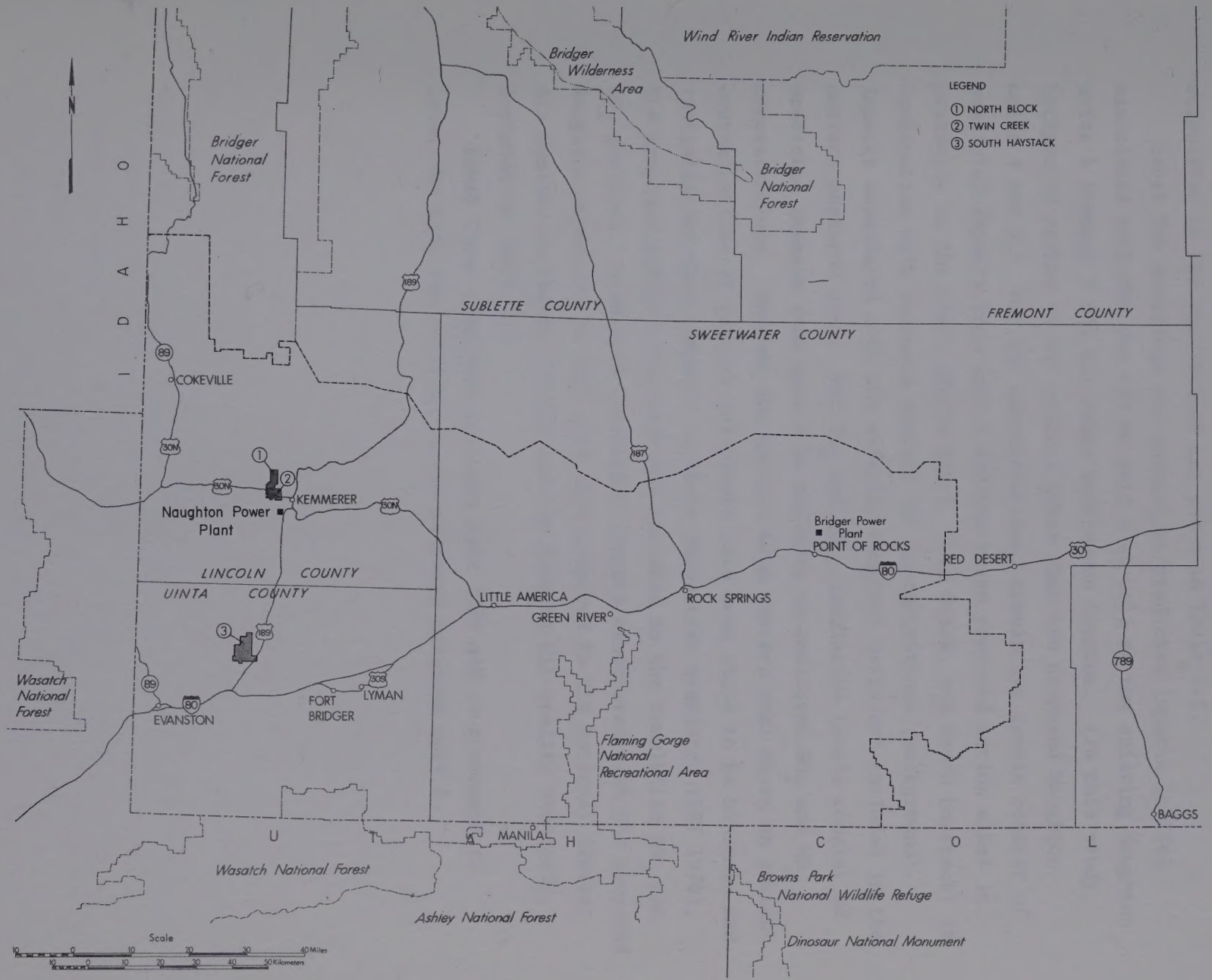

Figure 1-1 Location of the Naughton Power Plant

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would not be considered significant. Allowable air quality increments stipulated by PSD regulations are shown in Table 1-1.

Level Two describes the cumulative predicted impacts in 1985 associated with the new 430 Mw unit 4 as well as the existing Naughton units 1 through 3 and all other background sources. (In this study, background refers to all sources other than the proposed Naughton units 4 and 5.) For TSP concentrations, cumulative levels consist of predicted impacts from unit 4 and the three proposed action mines in proximity to the plant (North Block, Twin Creek, and South Haystack) in combination with measured ambient TSP concentrations (background). Impacts associated with the existing Naughton units are included in the ambient measured data. For SO_2 and NO_2, cumulative levels consist of predicted impacts from unit 4 in addition to monitored SO_2 and NO_2 concentrations. Because the impacts from western coal mines on ambient concentrations of gaseous pollutants have been shown to be minimal, and insignificant when compared to their respective standards (ERT 1978), the proposed action mines were not included in the cumulative SO_2 and NO_2 analyses. Predicted cumulative impacts associated with the proposed Naughton expansion in 1985 were then compared to the National Ambient Air Quality Standards (NAAQS) and the Wyoming air quality standards, depicted in Table 1-2.

Level Three considers analysis year 1990 and is analogous to Level Two with the addition of the proposed Naughton unit 5.

TABLE 1-1

ALLOWABLE PSD INCREMENTS FOR CLASS II AREAS

Pollutant	Averaging Period	Standard ($\mu g/m^3$)
TSP	Annual	19
	24-hour	37
SO_2	Annual	20
	24-hour	91
	3-hour	512

TABLE 1-2

WYOMING AND NATIONAL AMBIENT AIR QUALITY STANDARDS FOR CONCENTRATIONS OF TSP, SO_2, AND NO_2

Pollutant	Averaging Period	Standard ($\mu g/m^3$) National		Wyoming
		Primary*	Secondary**	
TSP	Annual[†]	75	60[††]	60
	24-Hour[§]	260	150	150
SO_2	Annual[§§]	80	-	60
	24-Hour[§]	365	-	260
	3-Hour[§]		1,300	1,300
NO_2	Annual[§§]	100	100	100

*Requisite to protect human health

**Requisite to protect the public welfare from any known or anticipated adverse effects

[†]Geometric Mean

[††]Guideline

[§]Not to be exceeded more than once per year

[§§]Arithmetic Mean

2. SUMMARY AND CONCLUSIONS

A worst-case modeling analysis was performed to estimate the predicted impact of two additional 430 Mw boiler units at the Naughton Power Plant on ambient TSP, SO_2, and NO_2 concentrations. The existing Naughton facility, located five miles southwest of Kemmerer, currently operates three boiler units with rated capacities of 160, 220, and 330 Mw. The first of the proposed new 430 Mw units was assumed to be operational in 1985 and the second in 1990.

Meteorological data used in the modeling analysis consisted of five years (1950 through 1954) of surface observations recorded at the Fort Bridger Airport. To simulate annual average concentrations, the meteorological data were processed in the form of a wind rose giving the joint frequency of occurrence of stability, wind direction, and wind speed. For short-term averages, Fort Bridger wind direction and wind speed persistence data were used to determine those worst-case conditions resulting in maximum predicted ground-level concentrations. Annual and short-term simulated levels were then compared with the applicable PSD increments. Predicted concentrations for the new boiler units were later combined with background concentrations to determine cumulative pollutant impacts. For SO_2 and NO_2, background levels were derived from ambient measured levels. With respect to particulates, ambient measured TSP concentrations were added to model simulations of the three proposed action mines in the area to determine background. Predicted cumulative pollutant levels were then compared with the NAAQS and Wyoming state standards to determine compliance with standards.

Table 2-1 lists the peak simulated pollutant concentrations attributable to unit 4 alone in 1985. Doubling the concentrations shown in Table 2-1 will depict predicted pollutant levels in 1990, when both proposed units are assumed operational. For every pollutant and averaging period considered, peak simulated concentrations are less than 12% and 24% of the corresponding PSD increments, such that the impacts attributable to the proposed Naughton expansion are well below the significant deterioration limits.

TABLE 2-1

PEAK SIMULATED POLLUTANT CONCENTRATIONS ATTRIBUTABLE TO UNIT 4 ALONE IN 1985

Pollutant	Concentration ($\mu g/m^3$) 3-Hour Average	24-Hour Average	Annual Average
TSP	NA	1	< 1
SO_2	29	10	< 1
NO_2	NA	NA	3

NA - averaging period not applicable

TABLE 2-2

PEAK SIMULATED CUMULATIVE POLLUTANT CONCENTRATIONS IN 1985 AND 1990

Pollutant	Concentration ($\mu g/m^3$) 3-Hour Average (1985/1990)	24-Hour Average (1985/1990)	Annual Average (1985/1990)
TSP	NA	219/186	30/28
SO_2	130/158	32/41	4/5
NO_2	NA	NA	10/12

NA - averaging period not applicable

Table 2-2 presents the peak simulated cumulative pollutant concentrations for 1985 and 1990, including the addition of background to predicted impacts at units 4 and 5. For SO_2 and NO_2, predicted cumulative levels are well below the NAAQS and Wyoming standards for all averaging periods in both analysis years. Simulated TSP concentrations for annual and 24-hour averages are less than the NAAQS, although predicted short-term levels are greater than the 150 $\mu g/m^3$ Wyoming standard. However, comparison of Tables 2-1 and 2-2 indicates that background concentrations heavily dominate simulated cumulative levels. Background levels are made up of estimated future ambient levels combined with predicted contributions of proposed strip mining activities. In the case of total projected TSP levels in 1985 and 1990, the largest portions of the short-term cumulative concentrations are associated with strip mines. On an annual average, other background sources and predicted TSP from the mines evenly make up the totals. Industrial sources such as existing coking, mining, and Naughton's power generating units constitute "other" background sources.

3. DESCRIPTION OF THE ENVIRONMENT IN THE VICINITY OF THE NAUGHTON POWER PLANT

The Naughton facility is located in Lincoln County approximately five miles southwest of Kemmerer and adjacent to the northeast flank of the Bear River Divide. The terrain in the vicinity of the power plant is irregular, with maximum deviations in elevation of 1,600 feet within a 15-mile radius of the facility. The terrain elevation at the Naughton plant is 7,000 feet.

Certain dispersion-influencing terrain features in the Naughton area are worth noting. To the east within five miles is the Oyster Ridge, which extends north-south from Bridger National Forest to Evanston (approximately 65 miles). Elevations along the Oyster Ridge reach 7,800 feet or 8,000 feet above the stack bases of the Naughton facility. The ridge is a major drainage divide, with the west slope draining via Twin Creek into the Great Basin and the east slope draining via Hams Fork into the Colorado drainage system. The upper slopes of the ridge are moderately steep and the lower slopes are gentle. To the southwest of the Naughton facility is the north slope of the Great Bear Divide notched by small water courses that are tributaries of Twin Creek. To the north and south of the plant site, terrain heights remain consistent with that of the plant (7,000 feet). Within three miles, the highest terrain features are equal to or less than the proposed Naughton units 4 and 5 stack tip elevations (7,600 feet). Within 10 to 15 miles the terrain rises no higher than 400 feet above the stack tips.

3.1 Existing Climate

A detailed regional description of southeast Wyoming's existing climate is presented in ERT Document P-3661, Regional Technical Report (ERT 1978). The following sections summarize the climate in the proximity of the Naughton Power Plant according to several climatological variables.

3.1.1 Sunshine

Since the Naughton plant is located in a high plains/foothills area, the annual percentage of possible sunshine is expected to approximate the 65% statewide average.

3.1.2 Wind

Although UPL operates four meteorological observation sites in the vicinity of the Naughton Power Plant, a substantial data base of surface wind statistics was not readily available. Therefore, five years of surface data collected at the Fort Bridger Airport, located in Uinta County, were chosen to represent meteorological conditions at the Naughton facility. However, a comparison of the two data sets is presented below.

Figure 3-1 presents the annual wind rose for Fort Bridger, which was used in the analysis. Fort Bridger is in Uinta County, about 32 miles southeast of the Naughton plant, at an elevation of 7,000 feet.

As indicated in Figure 3-1, the prevailing wind direction at Fort Bridger is from the west-southwest and occurs 25% of the time. The annual average wind speed associated with this direction is 20 miles per hour (mph). The second most prominent (by frequency of occurrence) wind direction, west, is shown to occur more than 23% of the time and has an associated annual average wind speed exceeding 18 mph. Winds from the west-southwest through the west-northwest (236 to 304°) occur about 64% of the time, with an average speed exceeding 18 mph annually. The annual average wind speed for all wind directions is 15 mph.

The Fort Bridger data indicate that calm conditions (wind speed less than 2 mph) are relatively rare. Annually, they occur only 6% of the time. A slight seasonal variation ranges from a minimum of 5% (fall) to a maximum of 7% (winter).

As previously mentioned, UPL owns a field network of four meteorological observation sites in the vicinity of its Naughton Power Plant. From a review of a one-year (1 August 1974 to 1 September 1975) compilation of surface wind statistics (Golden and Petersen 1976) at these sites, the predominant wind direction and speed characteristics observed

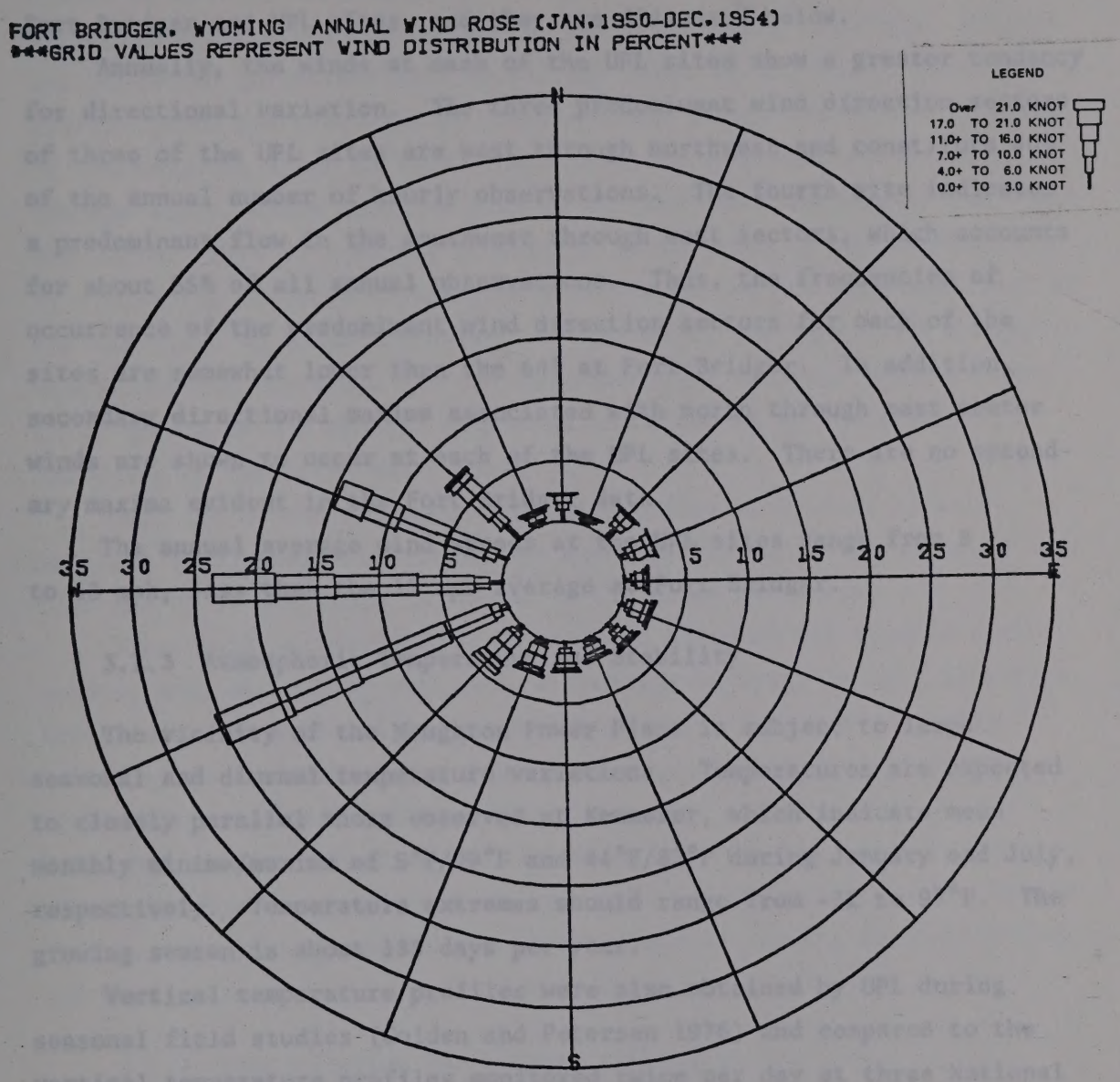

Figure 3-1 Annual Wind Rose for Fort Bridger

are comparable to the climatological values at Fort Bridger. However, there are some discernible differences in the surface winds between the Fort Bridger and UPL sites, and they are discussed below.

Annually, the winds at each of the UPL sites show a greater tendency for directional variation. The three predominant wind direction sectors of three of the UPL sites are west through northwest and constitute 40% of the annual number of hourly observations. The fourth site indicates a predominant flow in the southwest through west sectors, which accounts for about 55% of all annual observations. Thus, the frequencies of occurrence of the predominant wind direction sectors for each of the sites are somewhat lower than the 64% at Fort Bridger. In addition, secondary directional maxima associated with north through east sector winds are shown to occur at each of the UPL sites. There are no secondary maxima evident in the Fort Bridger data.

The annual average wind speeds at the UPL sites range from 8 to 13 mph, less than the 15 mph average at Fort Bridger.

3.1.3 Atmospheric Temperature and Stability

The vicinity of the Naughton Power Plant is subject to large seasonal and diurnal temperature variations. Temperatures are expected to closely parallel those observed at Kemmerer, which indicate mean monthly minima/maxima of 5°F/29°F and 44°F/82°F during January and July, respectively. Temperature extremes should range from -32 to 97°F. The growing season is about 185 days per year.

Vertical temperature profiles were also obtained by UPL during seasonal field studies (Golden and Petersen 1976) and compared to the vertical temperature profiles monitored twice per day at three National Weather Service (NWS) stations. The NWS sites closest to the study area and used in the comparison are located in Lander, Wyoming, Grand Junction, Colorado, and Salt Lake City, Utah. Like the surface wind data, the vertical temperature profile obtained by UPL is similar to the climatological values determined for the NWS radiosonde sites. However, some differences are notable.

Of all morning soundings (79 total), 85% contained some type of inversion (either surface-based or upper-level). The three NWS sites indicated about a 90% frequency. Of the UPL morning soundings, 65% had surface-based inversions with an average depth of 300 feet. Thus, the average depth and frequency of surface-based inversions in the vicinity of the Naughton plant is again lower than the approximate 800-foot average depth, which occurred with an 85% average frequency at the three NWS sites. This is probably because of faster wind speeds and/or lack of sheltering by large topographic barriers at the UPL locations than at the NWS sites at Lander, Wyoming (in the lee of the Wind River Range), Grand Junction, Colorado (in the Gunnison River Valley), and Salt Lake City, upwind of the Wasatch Mountains and affected by the stability influence of the Great Basin High.

Only 11% of the afternoon soundings (after 12:00 A.M. Local Standard Time) showed inversions of any type. Again, this value is less than the 25 to 35% range indicated at the three NWS sites.

Since most meteorological observation sites do not release radiosondes, and, where they are used, a sounding analysis is only performed twice daily, an indirect method for determining hourly atmospheric stability is desirable. A widely accepted stability classification scheme was suggested by Turner (1964) to serve this function. Table 3-1 presents the frequency of occurrence for the major stability classes at Fort Bridger (1950 through 1954) as determined by the Turner system. The table presents annual and seasonal results determined from the five years of hourly surface wind speed and cloud cover data.

3.1.4 Precipitation and Evapotranspiration

Annual average precipitation and total snowfall should approximate the climatological values of 9 inches and 55 inches, respectively, observed at Kemmerer.

An annual soil moisture deficit of about 10 inches recorded at Kemmerer should be characteristic of the Naughton plant environs. The growing season roughly coincides with the period of high soil moisture deficit.

TABLE 3-1

FREQUENCY OF OCCURRENCE OF THREE STABILITY CLASSES AT FORT BRIDGER

(%)

Period	Stability Class		
	Unstable	Neutral	Stable
Annual	13	68	19
Winter	7	79	14
Spring	10	72	16
Summer	23	54	23
Fall	12	66	22

3.1.5 Severe Weather Events

In the vicinity of the Naughton Power Plant, thunderstorms occur most frequently during the spring and summer months. Occasionally, these afternoon thunderstorms are accompanied by local gusty winds and hail. The frequency of occurrence of thunderstorm and hail days in the study area is approximately 30 and 3 days per year, respectively. The likelihood of tornados occurring in the study area is very low.

3.2 Existing Air Quality

Air quality data collected in the vicinity of the Naughton Power Plant during 1975 and 1976 were used to establish baseline conditions. The ambient air quality in the study area is described according to the six monitoring sites listed in Table 3-2 as well as shown in Figure 3-2. Four of the sites (A-1 through A-4) are owned and operated by UPL. Three of these sites monitor ambient TSP and SO_2 levels; site A-1 records TSP concentrations only. Monitor A-5 is privately owned and measures ambient TSP levels; the data recorded at A-5 were available for 1976 only. The remaining monitor, A-17, was established by the state in 1976 and records TSP, SO_2, and NO_2 concentrations. Baseline concentrations are attributable to all sources of pollutants, minor and major. These include sources such as construction, agriculture, open burning, aggregate storage, railroads, unpaved and paved roads, and vehicles, heavy and light duty. Major contributors to ambient TSP levels would be the existing mines, North Block, Twin Creek, North Haystack, and South Block. As well, major point sources include FMC and Stauffer Chemical in the vicinity of Kemmerer and Naughton.

3.2.1 Total Suspended Particulate Concentrations

Particulate samples obtained at monitors A-2, A-3, and A-4 represent background TSP levels in an industrialized environment, as these sensor locations were established to monitor the impact from existing coking, mining, and power generating facilities (Ursenbach 1976). The maximum 24-hour TSP concentrations measured at these sites in 1975 range from 103 $\mu g/m^3$ (69% of the federal secondary standard and the state

TABLE 3-2

AIR QUALITY MONITORS IN THE VICINITY OF THE NAUGHTON POWER PLANT

Site Code	Monitor	Location	County	Portion of Region	Monitoring Purpose/ Environment	Private or State Operation	Pollutants Monitored at Site
A-1	Naughton, K-4	Kemmerer	Lincoln	West	Background/Rural	Private	TSP
A-2	Naughton, K-3	Kemmerer	Lincoln	West	Impact/Industrial	Private	TSP, SO_2
A-3	Naughton, K-2	Kemmerer	Lincoln	West	Impact/Industrial	Private	TSP, SO_2
A-4	Naughton, K-1	Kemmerer	Lincoln	West	Impact/Industrial	Private	TSP, SO_2
A-5*	South Haystack		Lincoln	West	Background/Rural	Private	TSP
A-17**	Kemmerer	Kemmerer	Lincoln	West	Background/Rural	State	TSP, SO_2, NO_2

*Located approximately 12 miles due south of the Naughton facility

**Monitor established in 1976

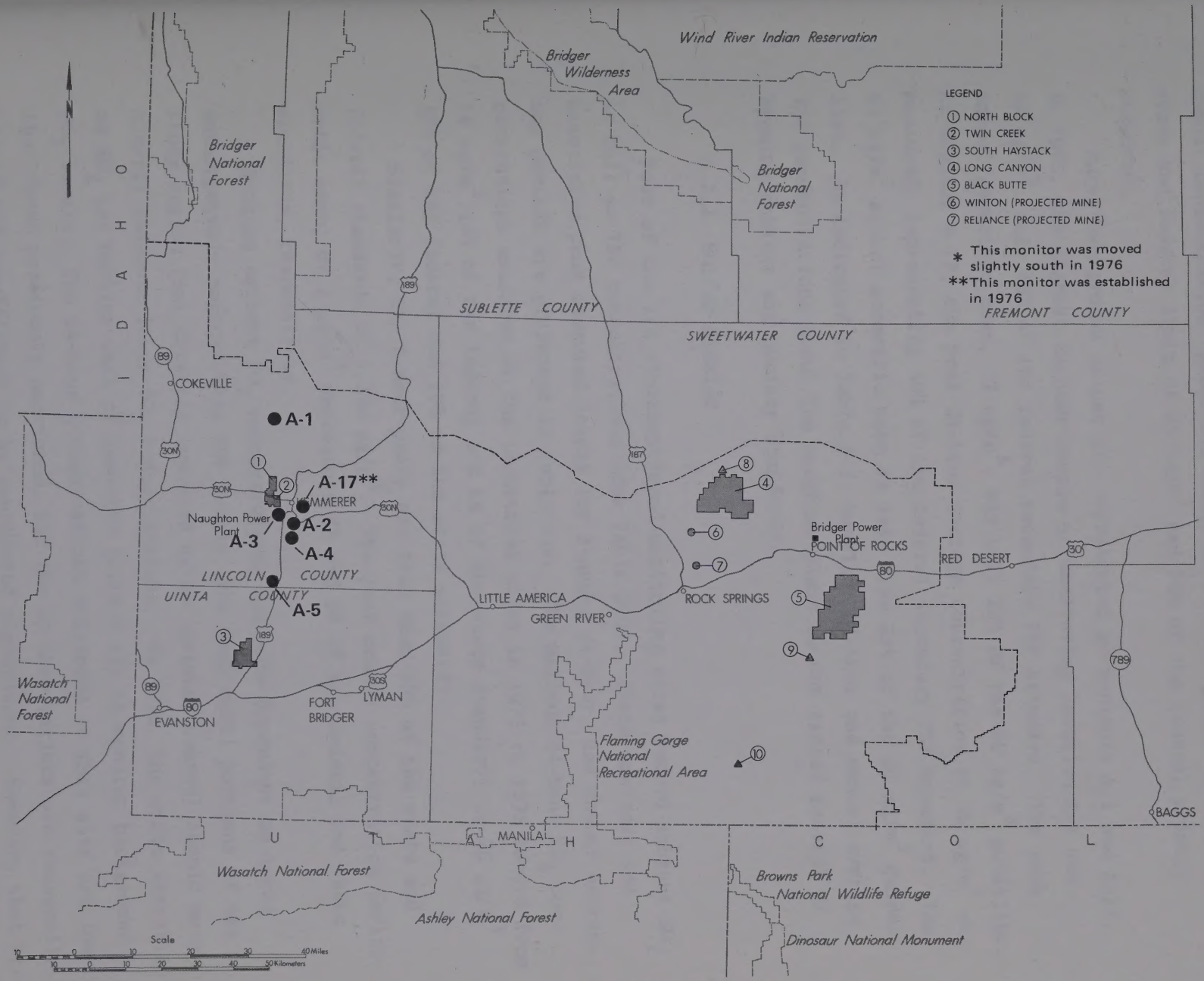

Figure 3-2 Locations of the Monitoring Sites in the Vicinity of the Naughton Power Plant

standard) to 69 $\mu g/m^3$ (less than half of these standards). The peak annual concentration (geometric mean) of 24 $\mu g/m^3$ represents 40% of the state and federal limit of 60 $\mu g/m^3$ and 32% of the federal primary standard.

Rural background values are represented by monitors A-1 and A-17. In 1975, the highest 24-hour sample at monitoring location A-1 was 59 $\mu g/m^3$, only 40% of the federal secondary TSP standard. The peak annual geometric mean, 12 $\mu g/m^3$, was only 20% of the 60 $\mu g/m^3$ guideline. At monitor A-17, the peak 24-hour average concentration of 45 $\mu g/m^3$ was measured, representing 30% of the federal secondary TSP standard. The 13 $\mu g/m^3$ annual geometric mean is less than 25% of the 60 $\mu g/m^3$ guideline. As indicated in Table 3-3, baseline 24-hour and annual average TSP concentrations about the Naughton plant do not exceed federal or Wyoming ambient air quality standards.

3.2.2 Sulfur Dioxide

Four of the six aforementioned monitoring sites record ambient SO_2 as well as TSP concentrations (see Table 3-2). These monitors and associated peak measured levels for 3-hour, 24-hour, and annual averaging periods are presented in Table 3-4. The maximum 24-hour SO_2 concentrations measured at the industrial sites in 1975 to 1976 ranged from 14 $\mu g/m^3$ (4% of the federal and 5% of the state standard) to 26 $\mu g/m^3$ (7% of the federal and 10% of the state standard).

Similarly, the 3-hour peaks are less than 10% of the state and federal standards of 1,300 $\mu g/m^3$. The peak annual concentration (arithmetic mean) of 3 $\mu g/m^3$ represents 4% and 5% of the federal and state standards, respectively.

Because ambient SO_2 concentrations are more dependent on local anthropogenic sources than TSP levels, the more rural portions of the study region (not directly impacted by an isolated source) should more clearly indicate lower SO_2 concentrations. In 1976, the state installed an SO_2 gas bubbler east of Kemmerer (Site A-17) to monitor background SO_2 levels. The 24-hour concentrations monitored at this site are lower than those previously mentioned, but the 10 observations are seasonally biased and insufficient to be considered significant. However, that the

TABLE 3-3

PARTICULATE CONCENTRATIONS ($\mu g/m^3$) MEASURED
IN THE VICINITY OF THE NAUGHTON POWER PLANT

Site Code	Sampling Year	Number of Observations*	Maximum 24-Hour Level	2nd Highest 24-Hour Level	Annual Geometric Mean
A-1	1975	22	59	44	12
A-2	1975	45	103	86	21
A-3	1975	40	83	77	20
A-4	1975	46	69	58	24
A-5	1976	27	68	64	28
A-17	1976	15	45	30	13

*Samples were obtained approximately every six days.

TABLE 3-4

SO_2 CONCENTRATIONS ($\mu g/m^3$) MEASURED IN THE VICINITY OF THE NAUGHTON POWER PLANT

Site Code	Sampling Year	Number of Observations		Maximum Levels		2nd Highest Levels		Arithmetic Annual Mean
		1-Hour	Daily	3-Hour	24-Hour	3-Hour	24-Hour	
A-2	1975-1976	8,491	350	115	24	86	21	2
A-3	1975-1976	7,514	304	89	14	89	11	0.7
A-4	1975-1976	8,056	331	105	26	100	22	3
A-17*	1976	-	10	-	5	-	2	1

*SO_2 gas bubbler providing 24-hour average alone

peak 24-hour SO_2 concentrations observed are on the order of the resolution of the instrument threshold does suggest that levels in these rural areas should be minimal in comparison to ambient standards.

3.2.3 Nitrogen Dioxide

A very limited amount of southwest Wyoming measured NO_2 data are available. In fact, there is only one monitoring site that measures NO_2 levels in the proximity of the Naughton facility (Monitor A-17). This monitor, owned and operated by the State of Wyoming Department of Environmental Quality (DEQ), is located in Kemmerer and is intended to measure rural background concentrations. The 1976 maximum 24-hour average concentration is reported by the DEQ as 14 $\mu g/m^3$ and the annual arithmetic mean as 7 $\mu g/m^3$, only 70% of the federal and state primary standard of 100 $\mu g/m^3$. These values were determined from nine observations taken in 1976 and, although they do not represent a valid annual sample, they are the only, and therefore best, available NO_2 information.

3.3 Future Air Quality

A detailed discussion of the projection of baseline levels to future years is presented in ERT Document P-3661, Regional Technical Report. Baseline TSP levels were projected to represent the expected ambient TSP levels in 1985 and 1990. Particulate contributions from the proposed Naughton units and proposed mine actions are excluded from the projection factors as they are included in the model predictions.

Since a sufficient data base from which to project NO_2 levels to future years was not available (see Section 3.2.3), the 1976 annual average concentration of 7 $\mu g/m^3$ is assumed to characterize NO_2 background levels in 1985 and 1990.

Annual and (2nd highest) 24-hour background SO_2 levels in the general vicinity of the Naughton and Kemmerer industrial areas were estimated for 1985 and 1990 from:

- ambient data (1975 through 1976) at monitors A-2, A-3, and A-4 in Lincoln County; and

- growth projections for all significant sources of SO_2 in Lincoln County (excluding the proposed Naughton units) for which essential data on source characteristics were available.

Significant SO_2 source categories in Lincoln County include fuel consumption for space heating, roadway vehicle exhaust, off-roadway vehicle exhaust (including haul trucks used in mining operations) and major point sources. Emission factors, quantities of fuel consumed and emission burdens in the baseline year are tabulated in Table 3-5.

To project the baseline emissions burdens to 1985 and 1990, surrogate indices were used to develop the appropriate scale factors. Fuel consumption for space heating was assumed to vary in proportion to county population. Roadway vehicle travel was assigned a lower scale factor to account for the heavy influence of rural travel on countywide vehicle miles traveled (VMT) and the markedly lower growth rate predicted for rural Lincoln County (outside Kemmerer/Diamondville). Off-roadway vehicle emissions are due mainly to farm equipment and are assumed to be proportional to employment in the agricultural sector. The only major point source emitters of SO_2 in the county, the three existing Naughton units, are assumed to remain constant in their contribution to the total SO_2 burden.

Scale factors and projected background emissions of SO_2 for Lincoln County are presented in Table 3-6. Because the existing Naughton plant accounts for more than 95% of the total burden in the base year as well as the two analysis years, overall SO_2 emissions are predicted to remain almost constant (a <u>total</u> increase of about 1% during the 1975 through 1985 period, with negligible growth thereafter). Therefore, background SO_2 in the industrial Kemmerer area is expected to fall within the range of concentrations recorded at Monitors A-2, A-3 and A-4 during the 1975 through 1976 base year, which are given below.

Time Period	Range of SO_2 ($\mu g/m^3$)
3-Hour	86-100
24-Hour	11-22
Annual	0.7-3

Thus, the 24-hour and annual SO_2 levels should remain below 10% and 5%, respectively, of the applicable Wyoming ambient standard.

TABLE 3-5

SUMMARY OF BASE YEAR SOURCE DATA FOR SO_2 EMISSIONS

Source Category	Quantity (per year)	Emission Factor	Annual Emissions (tons per year)
Fuel Consumption			
Coal*	9,644 tons (t)	38 lb/t	183.2
Distillate Oil**	$3,255 \times 10^3$ gal	144 lb/10^3 gal	234.4
Residual Oil†	$2,668 \times 10^3$ gal	288 lb/10^3 gal	384.2
Vehicular Exhaust			
Roadway	117.3×10^6 VMT§	0.253 t/10^6 VMT§	29.7
Nonroadway††	621×10^3 gal gasoline	2.2 g/gal	1.5
	401×10^3 gal diesel	12.9 g/gal	5.7
Point Sources			
Naughton #1	-	-	7,386
Naughton #2	-	-	7,056
Naughton #3	-	-	7,249

*Bituminous, assumed 1% sulfur (almost exclusively residential)

**Assume 1% sulfur

†Assume 2% sulfur

††Tractors and mine haul trucks

§VMT = Vehicle Miles Traveled

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P.O. Box 25047
Denver, CO 80225

TABLE 3-6

PROJECTED EMISSIONS OF SO_2 FOR LINCOLN COUNTY

Source Category	Scale Factors 1985/1990	Emissions (tons per year) Baseline ~ 1975/6	1985	1990
Fuel Consumption	1.35/1.37	802.6	1,083.5	1,099.6
Roadway Vehicle Exhaust	1.25/1.27	29.7	37.1	37.7
Nonroadway Vehicular Exhaust	0.69/0.69	7.2	5.0	5.0
Naughton Units #1, #2, and #3	1.0/1.0	21,691	21,691	21,691
TOTALS	1.01/1.01	22,531	22,818	22,835

4. DATA ANALYSIS

This section presents a discussion of the methods used to assess air quality impacts associated with the proposed expansion of the Naughton Power Plant.

4.1 The ERT Air Quality Model

The ERT air quality model (ERTAQ) was used to estimate the impacts of the proposed Naughton units on ambient SO_2, TSP, and NO_2 concentrations. ERTAQ is a Gaussian plume dispersion model that computes pollutant concentrations at a set of specific receptor sites, given the atmospheric stability, wind direction, and wind speed. These dispersion modeling techniques are similar to annual predictions using the Climatological Dispersion Model (CDM) specified in the EPA Interim Modeling Guidelines. A technical description of the ERTAQ model and corresponding model uncertainties is presented in ERT Document P-3661, Regional Technical Report (ERT 1978). The coefficients used in the calculation of vertical plume dispersion for a point source, however, differ from those depicted in the ERT report that correspond to area sources. The σ_z dispersion parameters used in ERTAQ to diffuse point source emissions were those suggested by the ASME (1968), which may be expressed in the functional form:

$$\sigma_z = ax^b$$

The values a and b are specified by downwind distance (x) as shown in Table 4-1.

4.2 Model Input Data and Assumptions

The two proposed Naughton units are identical in design, each having a generating capacity of 430 Mw. The stack and emission parameters used in the ERTAQ model simulations are presented in Table 4-2.

Naughton units 4 and 5 were modeled to simulate expected impacts on ambient TSP, SO_2, and NO_2 concentrations. To ascertain cumulative impacts associated with the tentative expansion, the proposed action coal mines in the vicinity of the plant (North Block, Twin Creek, and South Haystack) were also included in the TSP modeling analysis. Mine

TABLE 4-1

COEFFICIENTS USED IN CALCULATING VERTICAL PLUME DISPERSION

Stability Class	Coefficient a	Coefficient b
Very Unstable	0.40	0.91
Moderately Unstable	0.33	0.86
Slightly Unstable	0.22	0.78
Neutral	0.22	0.78
Stable	0.06	0.71

TABLE 4-2

STACK AND EMISSION PARAMETERS FOR THE PROPOSED NAUGHTON UNITS

Parameter	Unit 4	Unit 5
Capacity (Mw)	430	430
Stack Height (ft)	600	600
Stack Diameter (ft)	21.6	21.6
Exit Velocity (fps)	69.8	69.8
Exit Temperature (°F)	132	132
Flue Gas Flow Rate (ACFM)	1,534,631	1,534,631
SO_2 Emission Rate (g/sec)		
Maximum	107	107
Average*	86	86
TSP Emission Rate (g/sec)		
Maximum	11.4	11.4
Average*	9.1	9.1
NO_2 Emission Rate (g/sec)		
Average*	298	298

*Average emission rates are 80% of maximum emissions based on boiler capacity.

impacts on the gaseous pollutants (SO_2 and NO_2) were not simulated for the following reasons.

- Vehicle emissions are the only source of gaseous air pollutants attributable to the proposed action coal mines. Detailed data on vehicle use and applicable background data for gaseous pollutants were not available.
- Coal mining, in general, is a significant source of particulate emissions and its impact on SO_2 and NO_2 is relatively small.
- Recent studies (U.S. Department of the Interior 1976) of the impact of vehicle emissions associated with western coal mines indicate that maximum pollutant concentrations were insignificant when compared to standards.

The coal mine particulate emission rates as input to the TSP modeling analysis are presented in Table 4-3 for 1985 and 1990. The mines were simulated in ERTAQ as area sources, and these emission rates were assumed uniformly spread across each area source. An area source is defined as the active mine area at the year being analyzed. Derivation of the particulate emission rates as well as a detailed discussion of the methods used to simulate resultant particulate concentrations are presented in ERT Document P-3661, Regional Technical Report.

Topographical elevations around the Naughton plant and their effects on local diffusion characteristics were not considered in the modeling analysis because of time constraints, lack of data, and model limitations. However, the maximum deviation in terrain heights within a 15-mile radius of the Naughton plant is approximately 1,600 feet and the maximum rise in terrain above stack tip elevation is less than 400 feet. The introduction to Section 3 of this report details the topographic configurations in the vicinity of the Naughton facility. The extent to which such irregular terrain would affect the dispersion of emissions from the proposed Naughton units is unknown. If terrain were assumed to influence dispersion and the impact associated with the Naughton units were to double in magnitude, the overall results of this study would remain consistent.

TABLE 4-3

1985 AND 1990 PARTICULATE EMISSIONS FROM THE COAL MINES

(Tons Per Year)

Mine	1985	1990
North Block	1,021	930
Twin Creek	3,166	2,549
South Haystack	1,596	1,693
TOTAL	5,783	5,172

A stability wind rose derived from Fort Bridger meteorological observations was used to calculate annual average concentrations at specified receptor locations. The concentrations calculated for each receptor represent the weighted annual average for 480 possible weather conditions (16 wind directions times six wind speed classes times five stability classes).

Short-term standards for 3- and 24-hour averaging periods are written not to be exceeded more than once per year. This suggests worst-case analyses to determine whether or not concentrations exceeding these standards would occur. Worst-case short-term conditions are defined as the combination of poor atmospheric dispersion conditions and wind direction/wind speed persistence leading to maximum impact. For 3-hour average SO_2 concentrations, the meteorological condition throughout the 5-year period leading to maximum predicted impact from the proposed units corresponds to very unstable atmospheric conditions and a wind speed of 6 mph. In this case, wind direction is irrelevant, since the power plant is the only source of SO_2 modeled, and differences in terrain heights are not considered. For 24-hour average SO_2 and TSP concentrations, the meteorological condition leading to maximum predicted impact from the proposed units corresponds to 8 hours of very unstable conditions and a wind speed of 6 mph followed by 16 hours of neutral stability and a wind speed of 10 mph. For TSP, a south-southeast wind direction renders peak 24-hour average predicted levels by lining up the proposed Naughton units with the North Block and Twin Creek surface mines. Note that these worst-case meteorological conditions differ from those presented in ERT Document P-3661, Regional Technical Report in which model simulations were performed for the coal mines alone. For ground-level sources, such as a coal mine, a stable atmosphere leads to maximum ground-level concentrations since plume dispersion in the horizontal and vertical is limited. However, for a power plant, small values for σ_y and σ_z inhibit plume growth and lead to virtually zero ground-level impact in situations where terrain is not considered. Therefore, as presented in this report, worst-case meteorological conditions focus on the Naughton Power Plant, which is the primary source of interest. The aforementioned meteorological assumptions were made to evaluate worst-case conditions and are assumed to occur more than once per year.

4.3 Background Concentrations

In the context of this study, background is defined as the conglomeration of pollutant levels attributable to all sources in the vicinity of the Naughton Power Plant other than the proposed Naughton units 4 and 5, and the TSP concentrations attributable to the modeled proposed action mines. Section 3.3 of this report presents the estimated ambient TSP, SO_2, and NO_2 levels expected in 1985 and 1990. These values are used to represent background concentrations to be combined with the predicted impact values for each of the analysis years. In summary, the resultant 1985 and 1990 projected ambient TSP levels in the proximity of the Naughton plant are 15 $\mu g/m^3$ for annual averages and 46 $\mu g/m^3$ for 24-hour averages. The 1976 annual average concentration of 7 $\mu g/m^3$ is assumed to characterize NO_2 background levels in 1985 and 1990. Similarly, SO_2 background levels during the two future analyses years are expected to increase only slightly over the 1975, 1976 base year, or to be no greater than 101, 22, and 3 $\mu g/m^3$ for 3-hour, 24-hour, and annual averages, respectively.

5. MODEL RESULTS

This section presents the results of the model simulations according to three levels for each analysis year. The first level describes the incremental pollutant increase attributable to the addition of unit 4 alone in 1985. Level Two depicts the cumulative impacts associated with Naughton units 1 through 4 in 1985 plus all other background sources, and the third level describes the cumulative impacts corresponding to Naughton units 1 through 5 in 1990 in addition to all other background sources.

5.1 Level One: Naughton Unit 4 Alone, 1985 Incremental Increase

5.1.1 1985 Incremental TSP Increase

Annual average suspended particulate concentrations attributable to the addition of Naughton unit 4 were simulated using the ERTAQ model and the 1950 through 1954 annual wind rose derived from Fort Bridger Airport data. The wind direction with the highest frequency of occurrence leading to maximum predicted concentrations for unit 4 alone was identified as west-southwest. Resultant concentrations attributable to unit 4 were predicted to be quite low. Table 5-1 depicts these predicted levels for several downwind distances. As indicated, the peak concentration is less than 0.10 $\mu g/m^3$ and is predicted to occur at approximately 3.5 miles east-northeast of the facility. When compared to Class II PSD regulations, the maximum predicted concentration is less than 1% of the annual average.

Worst-case 24-hour average concentrations were simulated assuming 8 hours of very unstable atmospheric conditions and a wind speed of 6 mph followed by 16 hours of neutral stability and a wind speed of 10 mph. Resultant predicted suspended particulate concentrations attributable to unit 4 are presented in Table 5-1 for several downwind distances. The maximum concentration of approximately 1 $\mu g/m^3$ is predicted to occur 1 mile downwind of the source in any direction. As discussed in Section 4.2, for Level One, short-term analyses, wind direction is irrelevant because the power plant is the only source

TABLE 5-1

SIMULATED ANNUAL AND 24-HOUR AVERAGE SUSPENDED PARTICULATE CONCENTRATIONS ($\mu g/m^3$) ATTRIBUTABLE TO UNIT 4 ALONE

Downwind Distance (miles)	Annual Average Concentration	24-Hour Average Concentration
0.5	0.01	0.3
1.0	0.01	1.0
2.5	0.07	0.8
3.5	0.08	0.7
5.0	0.07	0.6
6.0	0.05	0.5
9.0	0.03	0.3
12.0	0.02	0.2
15.0	0.02	0.2

modeled and topography was not considered. When compared to PSD regulations, the peak predicted concentration is less than 3% of the 37 $\mu g/m^3$ allowable increment.

To assess the predicted impacts associated with the addition of both identical units 4 and 5 in 1990, one needs to double the concentrations depicted in Table 5-1. In this case, maximum predicted suspended particulate levels are less than 2% of the annual PSD increment and 6% of the 24-hour average PSD increment.

5.1.2 1985 Incremental SO_2 Increase

Annual average SO_2 concentrations attributable to the addition of Naughton unit 4 were simulated using the ERTAQ model and the 1950-1954 wind rose derived from the Fort Bridger Airport data. Wind direction from the southwest has the highest frequency of occurrence and leads to maximum predicted SO_2 levels. Worst-case 3- and 24-hour average meteorological conditions used in the modeling analysis are discussed in Section 4.2. The results of the model simulations for all three averaging periods are presented in Figure 5-1. Annual average concentrations are almost negligible with the peak concentration of 0.8 $\mu g/m^3$ predicted to occur 3.5 miles east-northeast of the plant. Simulated annual average levels out to 15 miles downwind of the Naughton facility range from 0.06 to 0.8 $\mu g/m^3$. The peak 24-hour average concentration of 10 $\mu g/m^3$ is predicted to occur approximately 1 mile downwind of the facility in any direction. Elsewhere, concentrations decrease proportionally with downwind distance. The peak 3-hour average concentration of 29 $\mu g/m^3$ is also predicted to occur 1 mile downwind of the Naughton plant. Table 5-2 lists the simulated annual, 3- and 24-hour average concentrations attributable to unit 4 for several downwind distances. When compared with the Class II PSD regulations, the maximum simulated annual, 24-hour, and 3-hour average concentrations are less than 4%, 11%, and 6%, respectively, of the corresponding increments.

To assess the predicted impacts associated with the addition of both identical units 4 and 5 in 1990, one needs to double the concentrations depicted in Table 5-2. In this case, maximum predicted SO_2 levels are less than 8%, 22%, and 12% of the annual, 24-hour, and 3-hour average PSD increments, respectively.

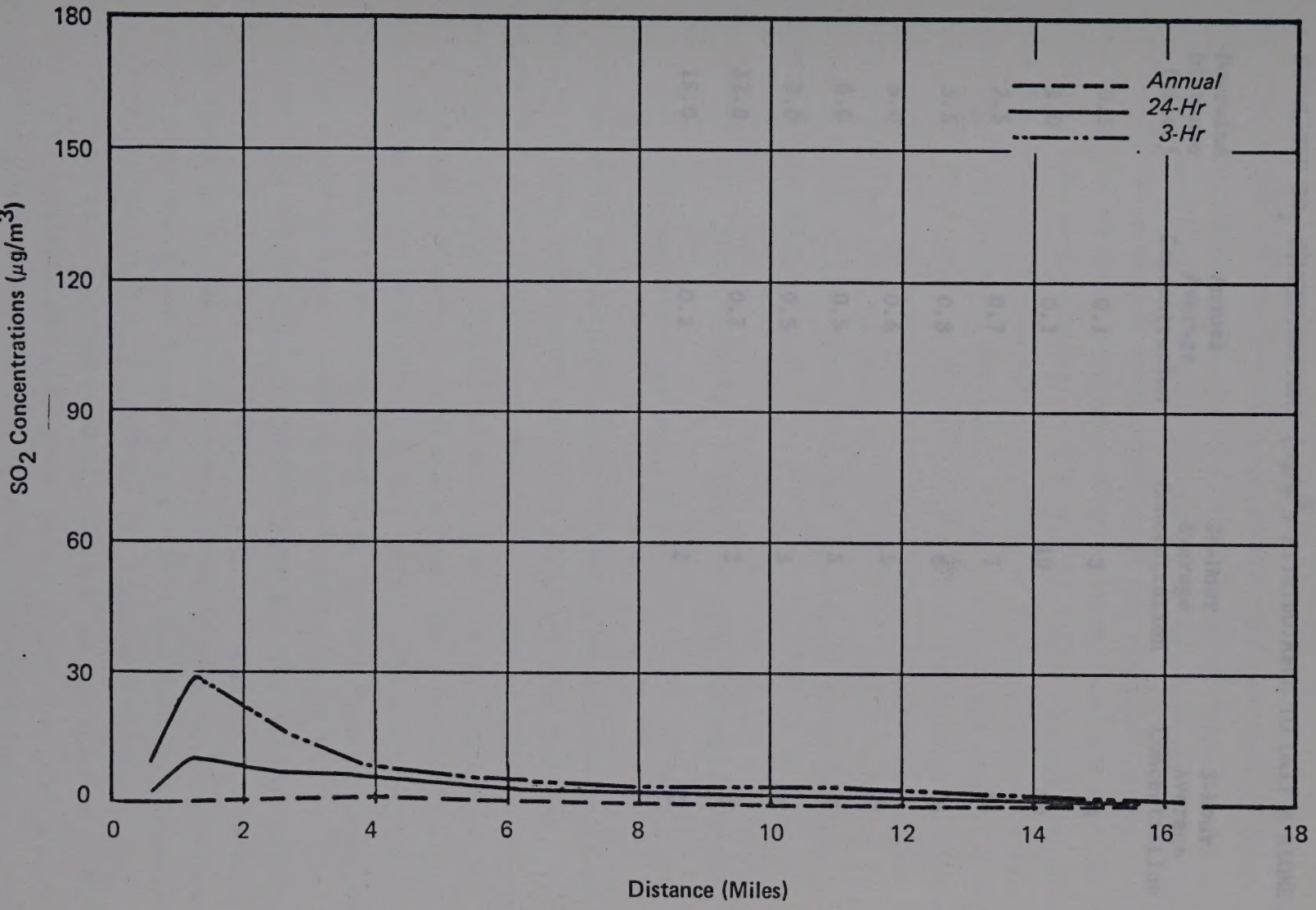


Figure 5-1 Predicted 1985 SO_2 Concentrations ($\mu g/m^3$) Attributable to Unit 4 Alone

TABLE 5-2

SIMULATED SO_2 CONCENTRATIONS ($\mu g/m^3$) ATTRIBUTABLE TO UNIT 4 ALONE

Downwind Distance (miles)	Annual Average Concentration	24-Hour Average Concentration	3-Hour Average Concentration
0.5	0.1	3	9
1.0	0.1	10	29
2.5	0.7	7	16
3.5	0.8	6	9
5.0	0.6	5	6
6.0	0.5	5	5
9.0	0.3	3	3
12.0	0.2	2	3
15.0	0.2	2	2

5.1.3 1985 Incremental NO_2 Increase

Annual average impacts on ambient NO_2 levels were evaluated using the ERTAQ model and a 5-year historical wind rose from Fort Bridger. Since both the NAAQS and the Wyoming State standards stipulate NO_2 levels for annual averages only, the impact of the Naughton expansion with respect to other averaging periods was not examined. Figure 5-2 presents the worst-case downwind profile for annual average impacts associated with west-southwest wind flow. As indicated, the peak simulated concentration of 2.6 $\mu g/m^3$ is predicted to occur 3.5 miles east-northeast of the proposed facility. Table 5-3 lists the simulated NO_2 levels at various downwind distances. To assess the impacts associated with the addition of unit 5 in 1990, one needs to double the concentrations depicted in Table 5-3.

At the time of this study, the PSD regulations do not provide incremental guidelines for NO_2.

5.2 Level Two: Naughton Units 1 through 4: 1985 Cumulative Impacts

5.2.1 1985 Cumulative TSP Impacts

To ascertain the cumulative impacts associated with the proposed expansion in 1985, particulate emissions emanating from both the Naughton unit 4 and proposed action mines were modeled. For both annual and 24-hour averaging periods, the worst-case wind direction was identified as south-southeast, because winds from this direction line up the plumes from both the power plant and the mines. Source interaction under the influence of south-southeast wind flow was found to yield peak predicted concentrations. Fixed background estimates of 15 $\mu g/m^3$ for annual averages and 46 $\mu g/m^3$ for 24-hour averages were combined with the model simulations to determine total air quality impacts. The results of this effort in the form of worst-case downwind profiles are presented in Figure 5-3. For annual averages, the unit 4 contribution to cumulative levels is less than 0.10 $\mu g/m^3$ for all downwind distances. The peak TSP concentration of approximately 30 $\mu g/m^3$ is predicted to occur 5 miles north-northwest of the Naughton facility. Of this peak concentration, background accounts for 15 $\mu g/m^3$ and the proposed mines account

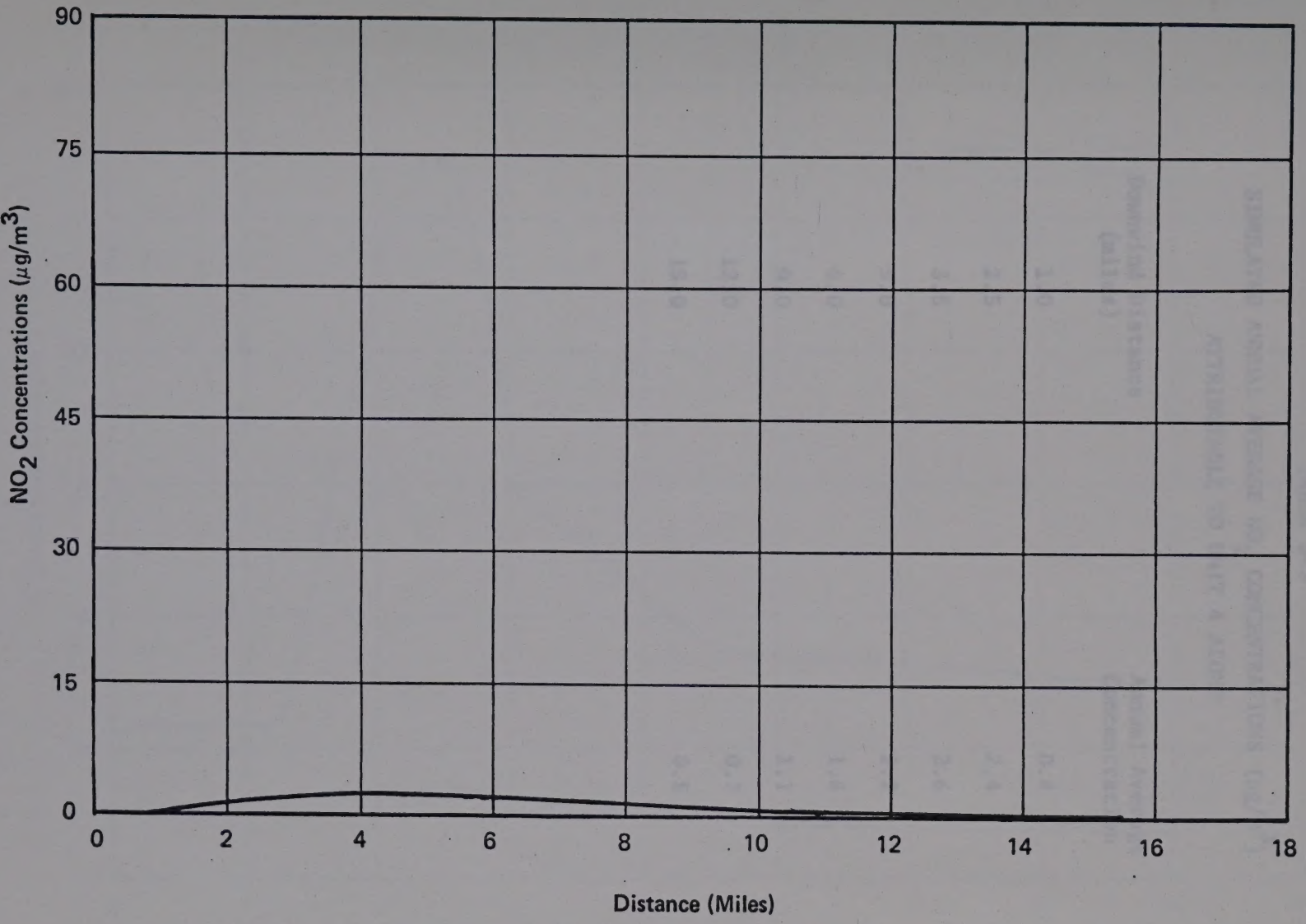


Figure 5-2 Predicted Annual Average NO_2 Concentrations ($\mu g/m^3$) Attributable to Unit 4 Alone

TABLE 5-3

SIMULATED ANNUAL AVERAGE NO_2 CONCENTRATIONS ($\mu g/m^3$)
ATTRIBUTABLE TO UNIT 4 ALONE

Downwind Distance (miles)	Annual Average Concentration
1.0	0.4
2.5	2.4
3.5	2.6
5.0	2.2
6.0	1.8
9.0	1.1
12.0	0.7
15.0	0.5

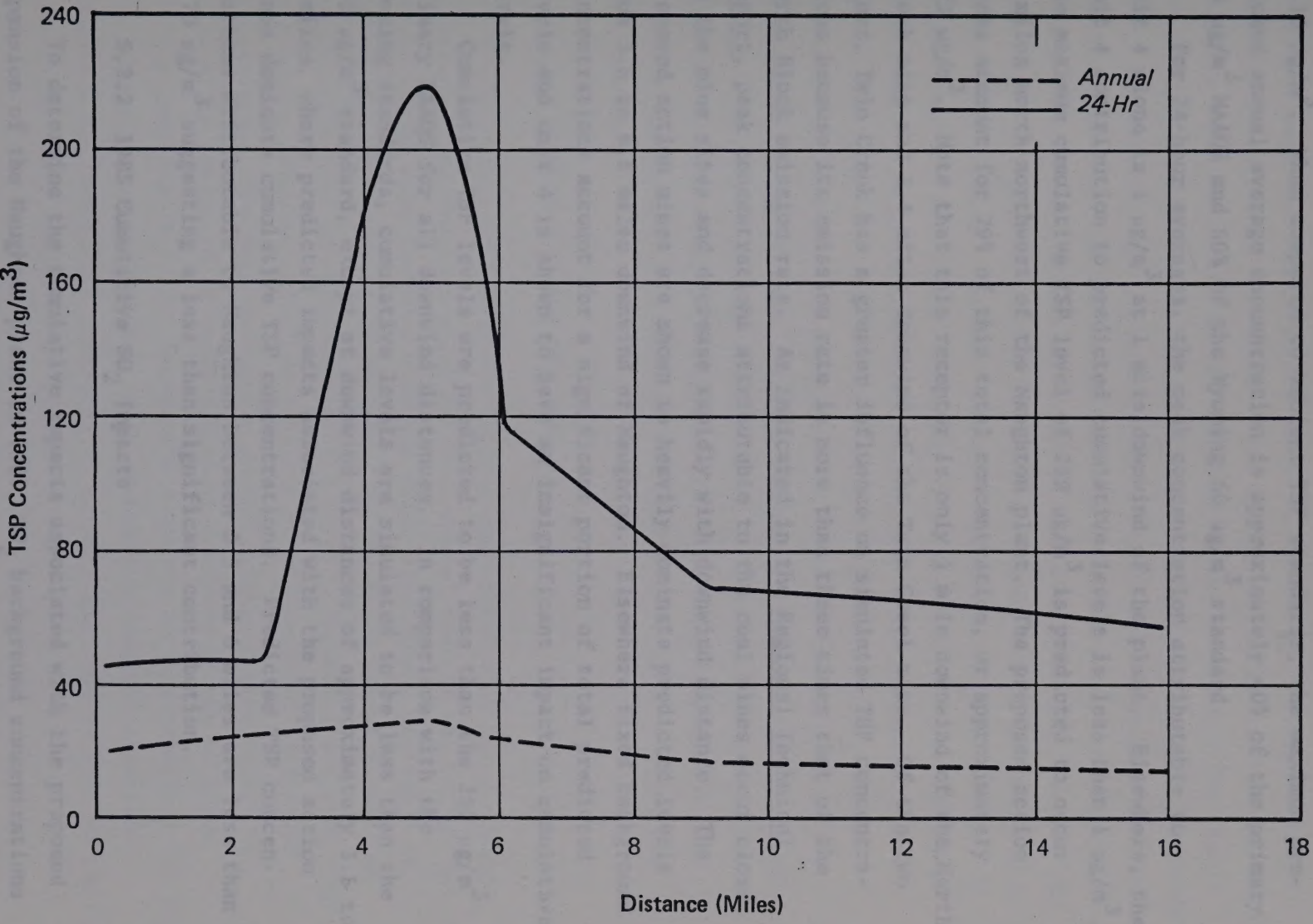
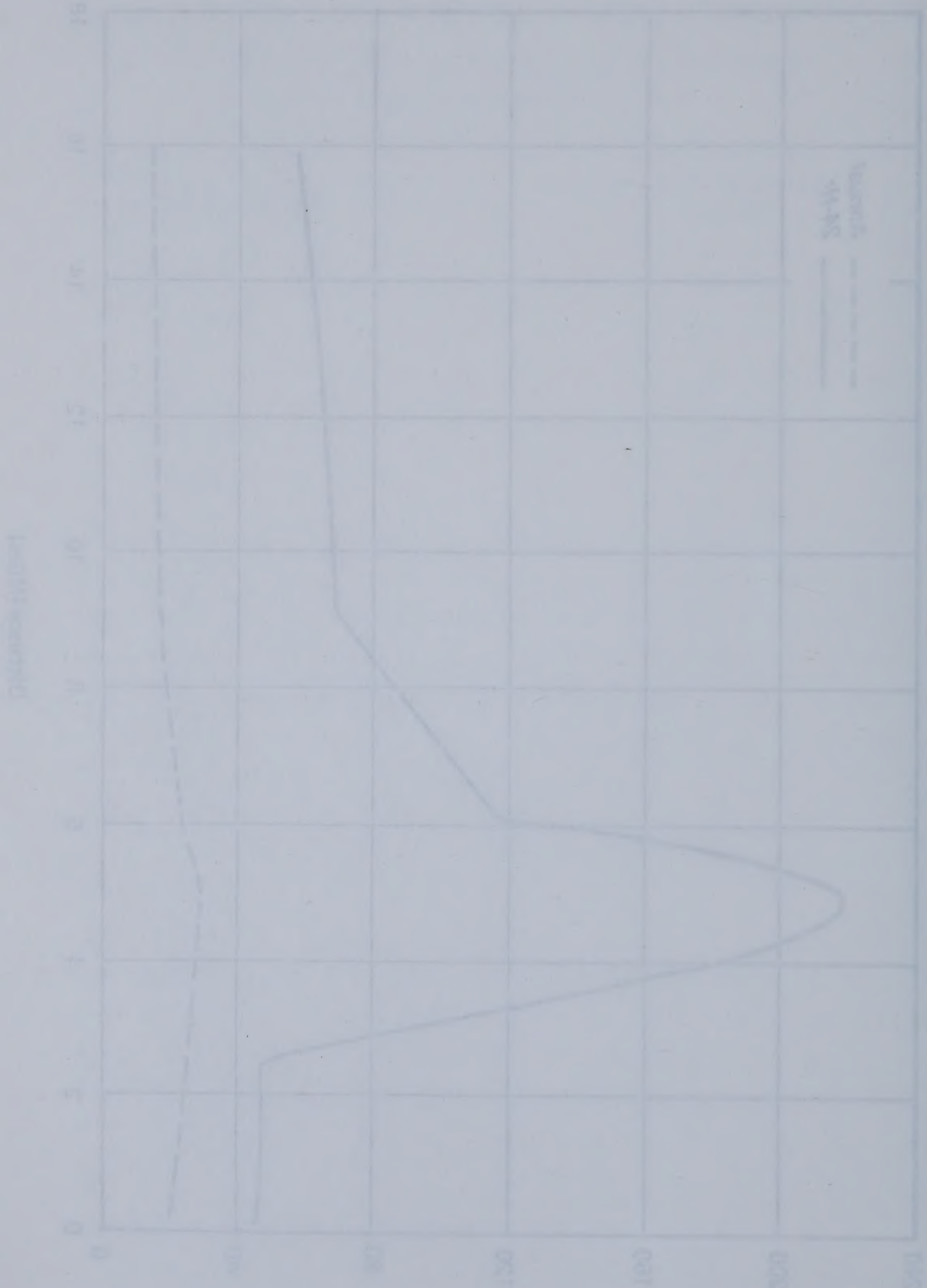


Figure 5-3 Cumulative TSP Concentrations (µg/m^3) Predicted for 1985



for the remaining 15 $\mu g/m^3$; the contribution from unit 4 is less than 0.10 $\mu g/m^3$. When compared to ambient TSP standards, the maximum predicted annual average concentration is approximately 40% of the primary 75 $\mu g/m^3$ NAAQS and 50% of the Wyoming 60 $\mu g/m^3$ standard.

For 24-hour averages, the peak concentration attributable to unit 4 alone is 1 $\mu g/m^3$ at 1 mile downwind of the plant. Elsewhere, the unit 4 contribution to predicted cumulative levels is less than 1 $\mu g/m^3$. The maximum cumulative TSP level of 219 $\mu g/m^3$ is predicted to occur 5 miles north-northwest of the Naughton plant. The proposed action mines account for 79% of this total concentration, or approximately 173 $\mu g/m^3$. Note that this receptor is only 1 mile downwind of the North Block mine and 1.4 miles downwind of the Twin Creek mine. Of the two mines, Twin Creek has a greater influence on simulated TSP concentrations because its emission rate is more than three times that of the North Block emission rate. As indicated in the Regional Technical Report, peak concentrations attributable to the coal mines occur close to the mine sites and decrease rapidly with downwind distance. The proposed action mines are shown to heavily dominate predicted levels from 3.5 to 6.5 miles downwind of Naughton. Elsewhere fixed background concentrations account for a significant portion of total predicted levels and unit 4 is shown to have an insignificant impact on cumulative levels.

Cumulative TSP levels are predicted to be less than the 260 $\mu g/m^3$ primary NAAQS for all downwind distances. In comparison with the Wyoming standards, cumulative levels are simulated to be less than the 150 $\mu g/m^3$ standard, except at downwind distances of approximately 3.5 to 6 miles, where predicted impacts associated with the proposed action mines dominate cumulative TSP concentrations. Predicted TSP concentrations attributable to Naughton between 3.5 and 6 miles are less than 0.70 $\mu g/m^3$ suggesting a less than significant contribution.

5.2.2 1985 Cumulative SO_2 Impacts

To determine the cumulative impacts associated with the proposed expansion of the Naughton plant in 1985, SO_2 background concentrations presented in Section 4.3 were combined with the simulated model results

depicted in Figure 5-1. These background levels include the impacts associated with existing Naughton units 1, 2, and 3. To maintain a conservative approach, the upper bound of the SO_2 background ranges were scaled by the 1.01 growth factor and used in the analysis. The resultant background levels for annual, 24-hour, and 3-hour averaging periods are 3, 22, and 101 $\mu g/m^3$, respectively. Figure 5-4 presents the worst-case downwind profiles for simulated 1985 cumulative SO_2 concentrations. Since the background levels are constant for each averaging period, the location of the peak predicted SO_2 concentrations remain unchanged from the previous section. Maximum cumulative predicted SO_2 levels for annual, 24-hour, and 3-hour averaging times are 3.8, 32, and 130 $\mu g/m^3$ respectively. Background levels constitute a major portion of these total concentrations. For annual averages, the maximum SO_2 concentration is predicted to be approximately 5% of the primary 80 $\mu g/m^3$ NAAQS and 6% of the 60 $\mu g/m^3$ Wyoming standard. For 24-hour averaging periods, the peak predicted concentration is less than 9% and 12% of the NAAQS and Wyoming standard, respectively. The peak predicted 3-hour average concentration is less than 10% of the 1300 $\mu g/m^3$ federal and state standard.

5.2.3 1985 Cumulative NO_2 Impacts

To determine the cumulative impacts associated with the proposed expansion of the Naughton plant in 1985, annual average NO_2 background concentrations were combined with the model simulations presented in Figure 5-2. As discussed in Section 4.3, the fixed annual background concentration used in the analysis is 7 $\mu g/m^3$. Impacts associated with the existing Naughton units are implicit in the measured background concentration. The peak cumulative annual average concentration of 9.6 $\mu g/m^3$ is predicted to occur 3.5 miles downwind of the Naughton facility (see Figure 5-5). Background accounts for approximately 73% of this cumulative concentration. When compared to ambient standards, cumulative NO_2 levels are predicted to be less than 10% of the 100 $\mu g/m^3$ federal and state standards in 1985.

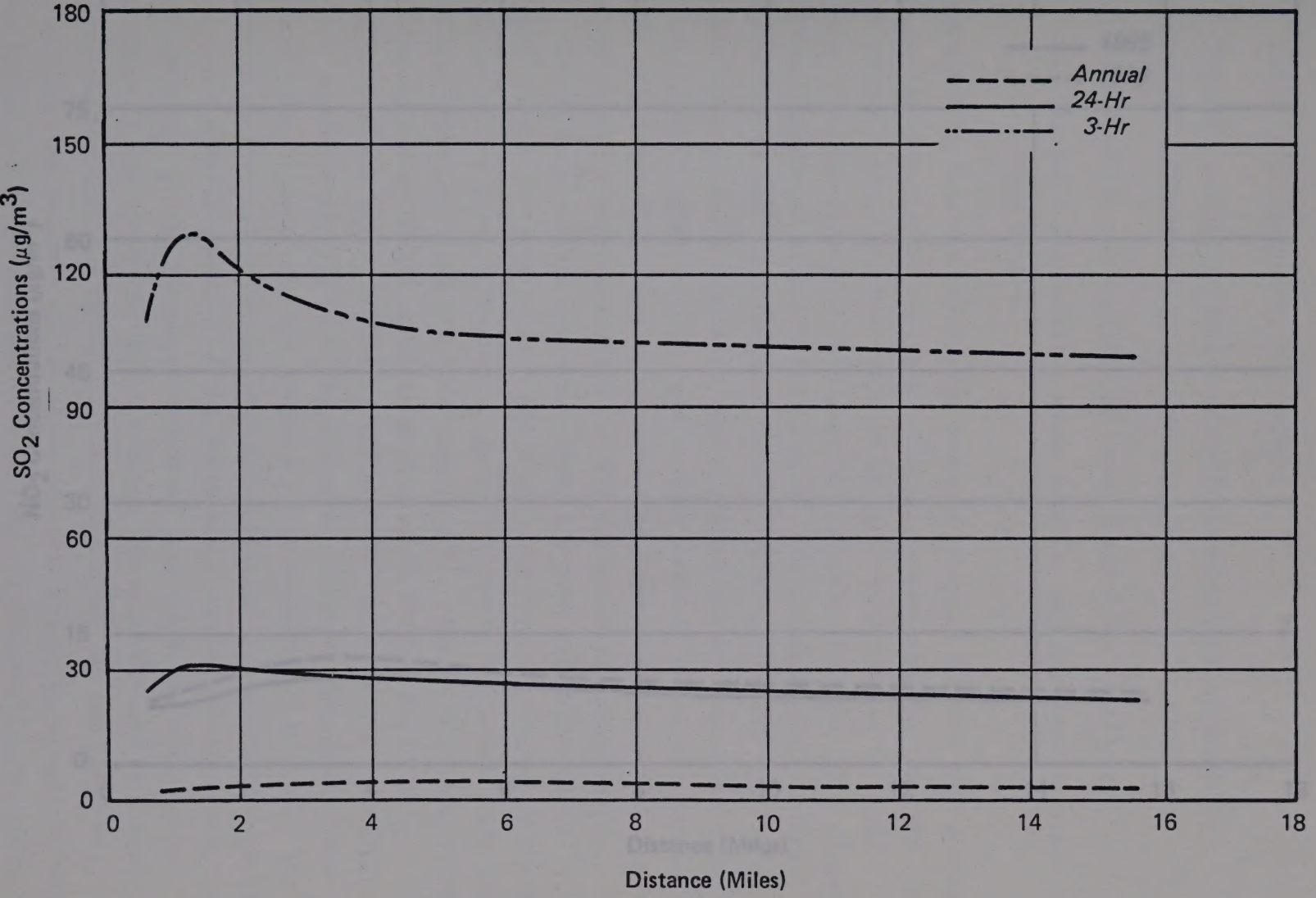


Figure 5-4 Cumulative SO_2 Concentrations ($\mu g/m^3$) Predicted for 1985

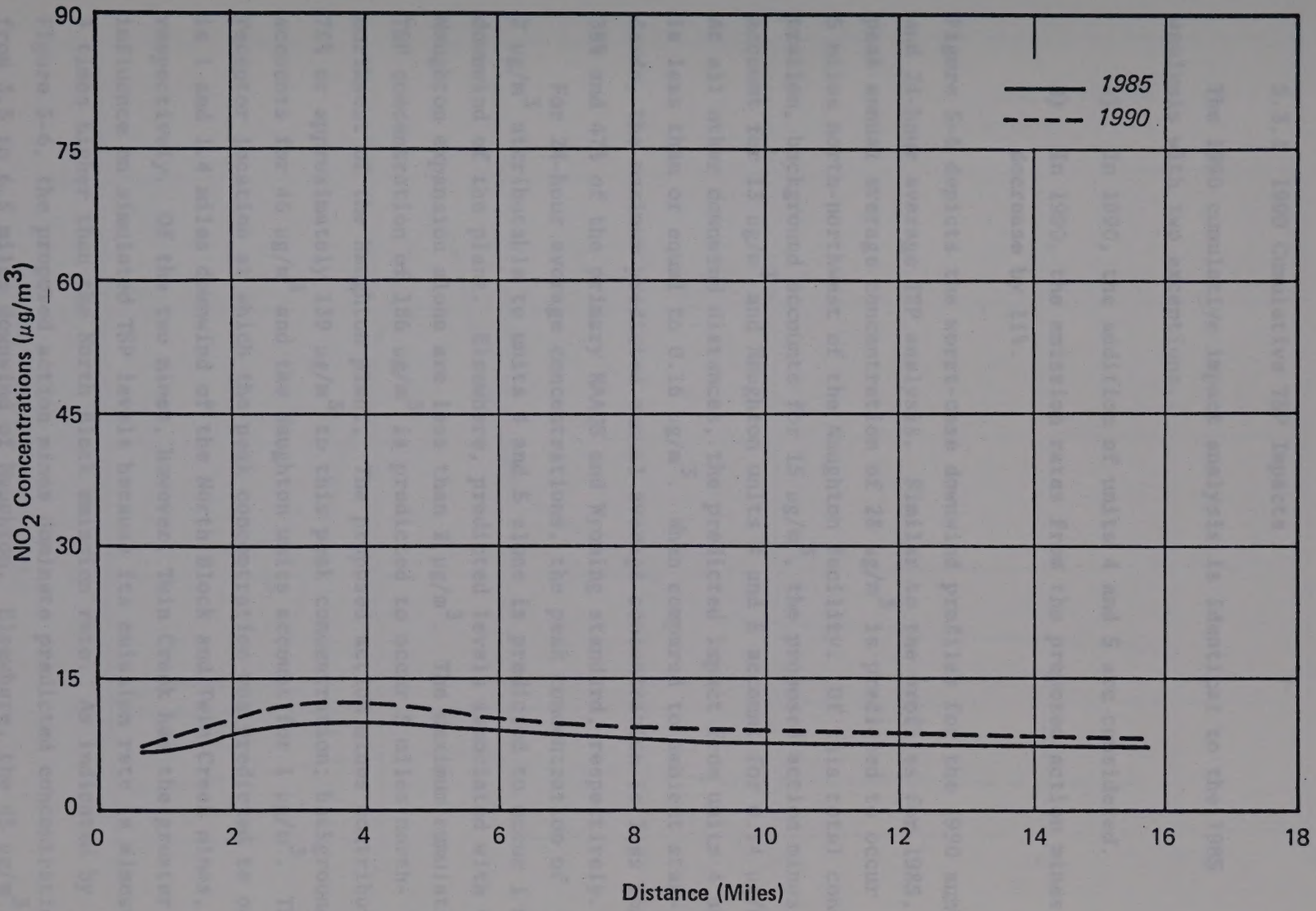


Figure 5-5 Cumulative Annual Average NO_2 Concentrations ($\mu g/m^3$) Predicted for 1985 and 1990

5.3 Level Three: Naughton Units 1 through 5, 1990 Cumulative Impacts

5.3.1 1990 Cumulative TSP Impacts

The 1990 cumulative impact analysis is identical to the 1985 analysis with two exceptions.

1) In 1990, the addition of units 4 and 5 are considered.

2) In 1990, the emission rates from the proposed action mines decrease by 11%.

Figure 5-6 depicts the worst-case downwind profiles for the 1990 annual and 24-hour average TSP analysis. Similar to the profiles for 1985, the peak annual average concentration of 28 $\mu g/m^3$ is predicted to occur 5 miles north-northwest of the Naughton facility. Of this total concentration, background accounts for 15 $\mu g/m^3$, the proposed action mines account for 13 $\mu g/m^3$ and Naughton units 4 and 5 account for 0.14 $\mu g/m^3$. At all other downwind distances, the predicted impact from units 4 and 5 is less than or equal to 0.16 $\mu g/m^3$. When compared to ambient standards, the maximum predicted annual average concentration is less than 38% and 47% of the primary NAAQS and Wyoming standard, respectively.

For 24-hour average concentrations, the peak concentration of 2 $\mu g/m^3$ attributable to units 4 and 5 alone is predicted to occur 1 mile downwind of the plant. Elsewhere, predicted levels associated with the Naughton expansion alone are less than 2 $\mu g/m^3$. The maximum cumulative TSP concentration of 186 $\mu g/m^3$ is predicted to occur 5 miles north-northwest of the Naughton plant. The proposed action mines contribute 75% or approximately 139 $\mu g/m^3$ to this peak concentration; background accounts for 46 $\mu g/m^3$ and the Naughton units account for 1 $\mu g/m^3$. The receptor location at which the peak concentration was predicted to occur is 1 and 1.4 miles downwind of the North Block and Twin Creek mines, respectively. Of the two mines, however, Twin Creek has the greater influence on simulated TSP levels because its emission rate is almost 3 times higher than the North Block emission rate. As indicated by Figure 5-6, the proposed action mines dominate predicted concentrations from 3.5 to 6.5 miles downwind of Naughton. Elsewhere, the 45 $\mu g/m^3$ background levels constitute a significant portion of total simulated

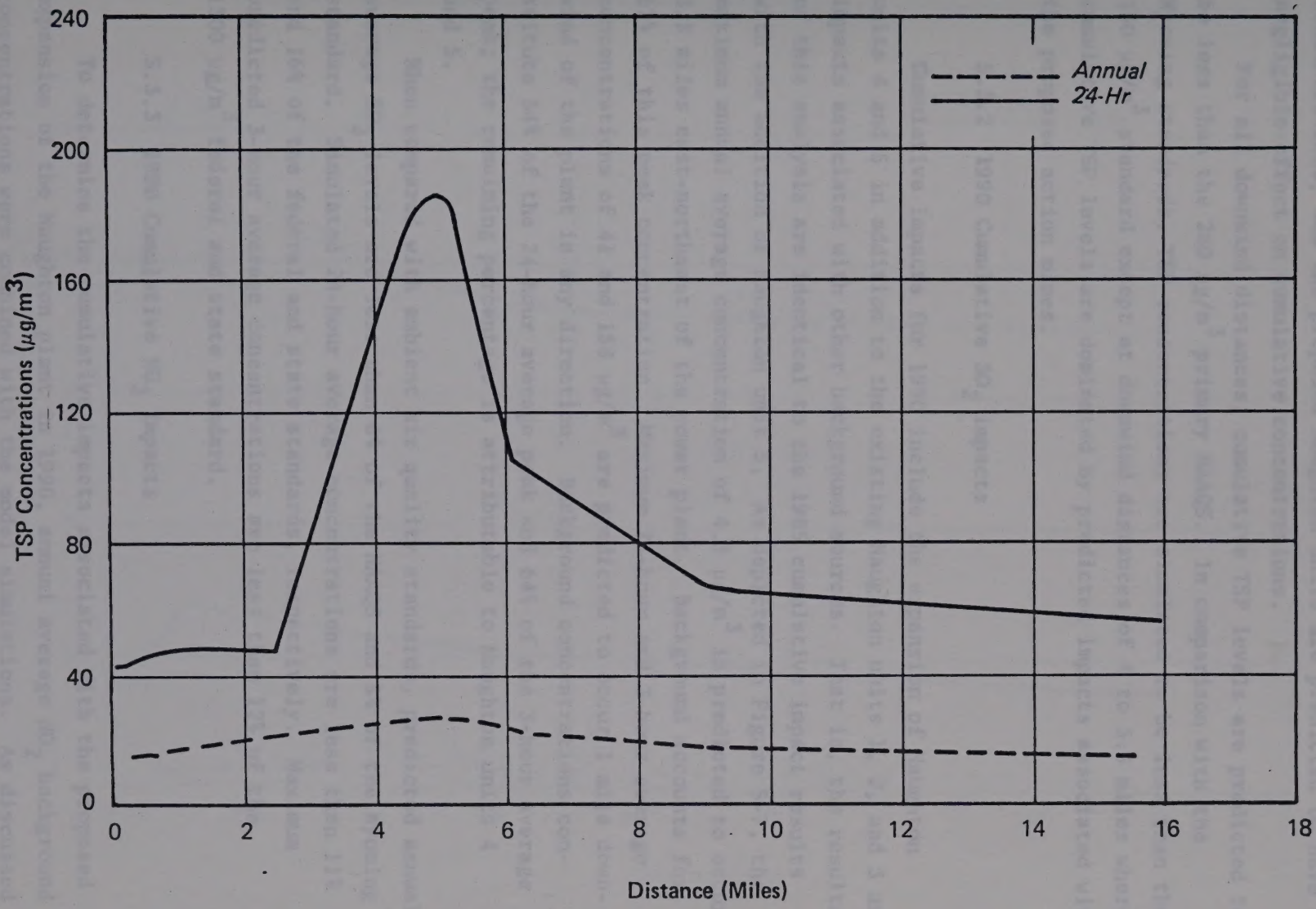
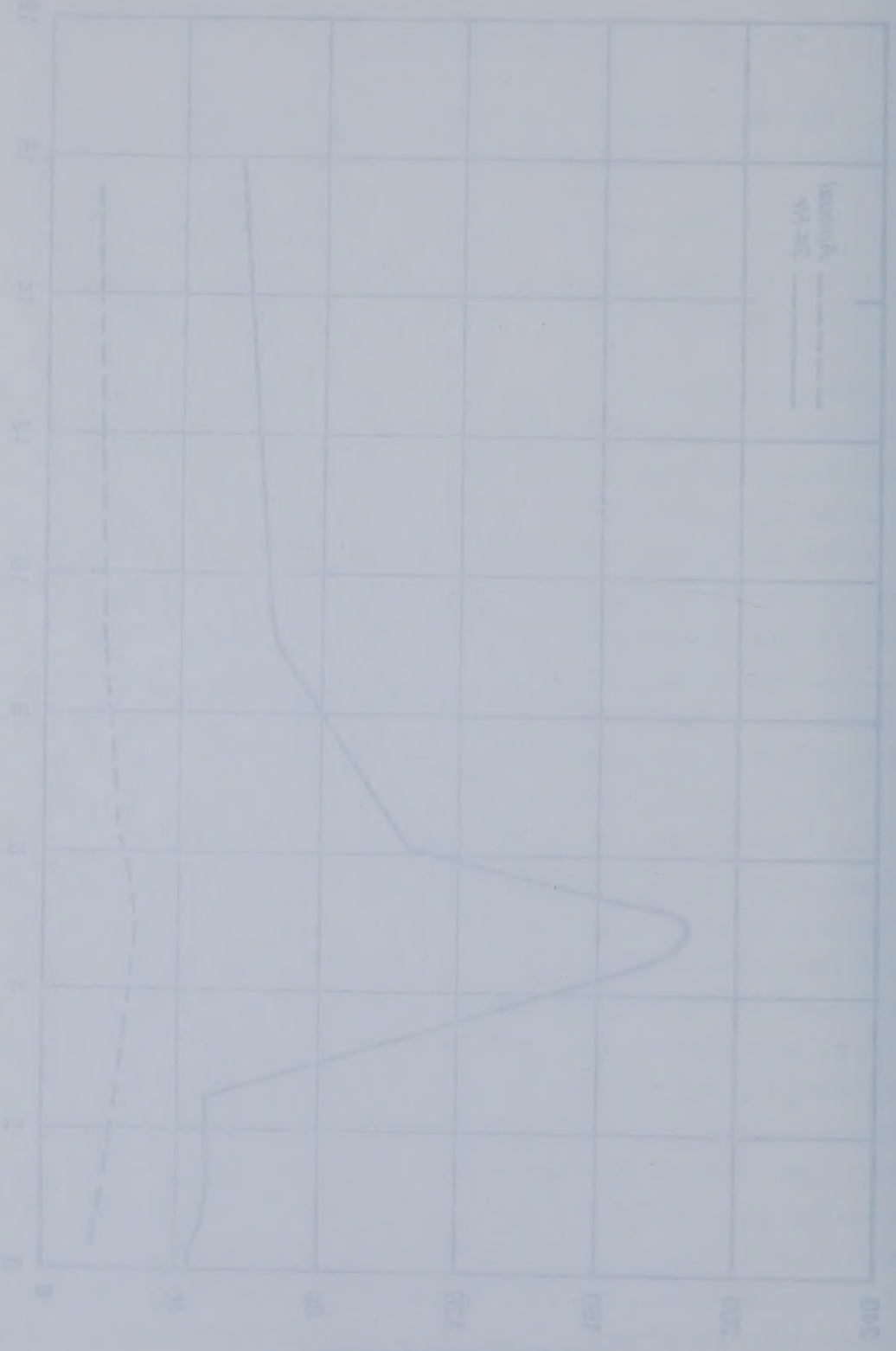


Figure 5-6 Cumulative TSP Concentrations ($\mu g/m^3$) Predicted for 1990



concentrations, and the proposed Naughton units are predicted to have a negligible effect on cumulative concentrations.

For all downwind distances, cumulative TSP levels are predicted to be less than the 260 $\mu g/m^3$ primary NAAQS. In comparison with the Wyoming standards, TSP concentrations are simulated to be less than the 150 $\mu g/m^3$ standard except at downwind distances of 4 to 5.5 miles where cumulative TSP levels are dominated by predicted impacts associated with the proposed action mines.

5.3.2 1990 Cumulative SO_2 Impacts

Cumulative impacts for 1990 include the expansion of Naughton units 4 and 5 in addition to the existing Naughton units 1, 2, and 3 and impacts associated with other background sources. That is, the results of this analysis are identical to the 1985 cumulative impact results with the addition of Naughton unit 5. As depicted in Figure 5-7, the maximum annual average concentration of 4.5 $\mu g/m^3$ is predicted to occur 3.5 miles east-northeast of the power plant. Background accounts for 67% of this peak concentration. Maximum 24-hour and 3-hour average concentrations of 41 and 158 $\mu g/m^3$ are predicted to occur 1 mile downwind of the plant in any direction. Background concentrations constitute 54% of the 24-hour average peak and 64% of the 3-hour average peak; the remaining percentage is attributable to Naughton units 4 and 5.

When compared with ambient air quality standards, predicted annual average SO_2 levels are less than 6% of the NAAQS and 8% of the Wyoming standard. Simulated 24-hour average concentrations are less than 11% and 16% of the federal and state standards, respectively. Maximum predicted 3-hour average concentrations are less than 12% of the 1300 $\mu g/m^3$ federal and state standard.

5.3.3 1990 Cumulative NO_2 Impacts

To determine the cumulative impacts associated with the proposed expansion of the Naughton plant in 1990, annual average NO_2 background concentrations were combined with the model simulations. As discussed

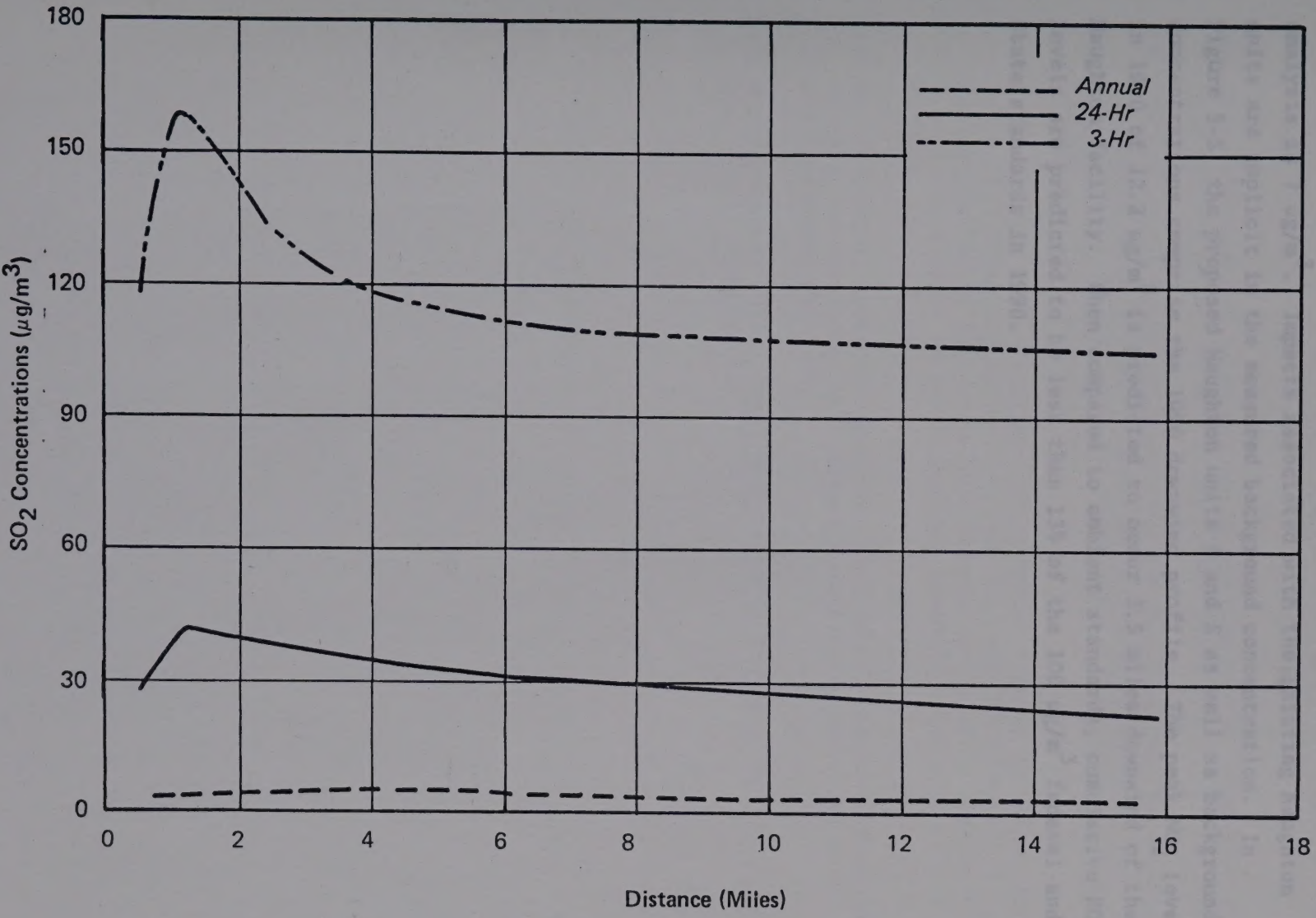
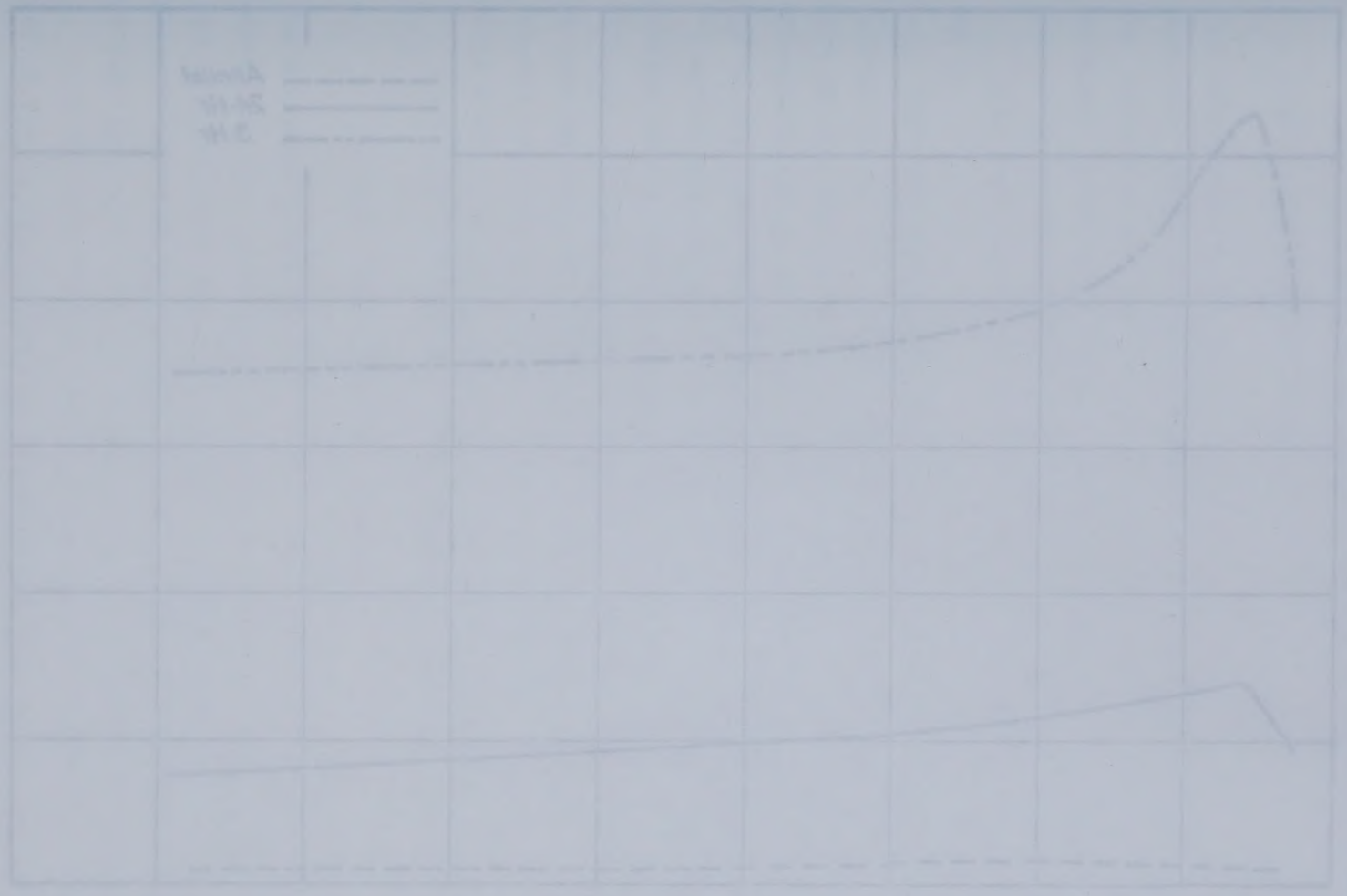


Figure 5-7 Cumulative SO_2 Concentrations ($\mu g/m^3$) Predicted for 1990



in Section 4.3, the fixed annual background concentration used in the analysis is 7 $\mu g/m^3$. Impacts associated with the existing Naughton units are implicit in the measured background concentration. In Figure 5-5, the proposed Naughton units 4 and 5 as well as background concentrations comprise the 1990 downwind profile. The peak NO_2 level in 1990 of 12.2 $\mu g/m^3$ is predicted to occur 3.5 miles downwind of the Naughton facility. When compared to ambient standards, cumulative NO_2 levels are predicted to be less than 13% of the 100 $\mu g/m^3$ federal and state standards in 1990.

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696 VIRGINIA ROAD, CONCORD, MASSACHUSETTS 01742 CABLE-ERTCON

CONCORD (617) 369-8910 **FORT COLLINS, CO** (303) 493-8878
BILLINGS, MT (406) 252-2184 **CHICAGO** (312) 620-5900
ATLANTA (404) 955-3121 **LOS ANGELES** (213) 889-5313
HOUSTON (713) 960-1422 **PITTSBURGH** (412) 261-2910